

REMARKS

The Examiner has rejected claims 32-44 under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 1-3, 5, 7, 9, 11, 13, 15, 18, 20, 22, 24, 26, 32, 34-35, 37, 39 and 41 are rejected under 35 U.S.C. § 102(b) as being anticipated by Hosoda et al. Japanese Patent No. 8-340666 ("Hosoda"). Claims 4, 6, 10, 17, 19, 23 and 38 are rejected under § 103(a) as being unpatentable over Hosoda. Claims 8, 21 and 36 are rejected under § 103(a) as being unpatentable over Hosoda in view of Achikita et al. U.S. Patent No. 5,091,022. Claims 12, 25 and 40 are rejected under § 103(a) as being unpatentable over Hosoda in view of Young U.S. Patent No. 5,701,943. Claims 27 and 42 are rejected under § 103(a) as being unpatentable over Hosoda in view of Gazza U.S. Patent No. 3,864,154. Claims 28 and 43 are rejected under § 103(a) as being unpatentable over Hosoda in view of Madsac U.S. Patent No. 4,713,215. Claims 31 and 44 are rejected under § 103(a) as being unpatentable over Hosoda in view of Uchida U.S. Patent No. 5,010,266. Claims 14 and 29-30 are objected to as being dependent upon a rejected base claims, but would be allowable if rewritten in independent form. Claim 33 would be allowable if rewritten to overcome the rejections under § 112, second paragraph, and to include all of the limitations of the base claim and any intervening claims.

By this amendment, withdrawn claims 45-70 are cancelled, new claims 71-86 are added, and claims 1, 2, 14, 15, 19, 29, 32 and 33 are amended.

Rejection under § 112

With respect to the rejection under § 112, 2nd ¶, although Applicant disagrees that the term "optionally" renders the claim indefinite, and the term is not *per se* objectionable according to MPEP § 2173.05(h), for the purpose of furthering prosecution, Applicant has

nonetheless broken claims 32-44 into two separate claim sets, with claims 32-44 having the optional step deleted, and new claims 71-84 containing the formerly optional step as a positively-recited step.

Rejection under § 102

With respect to the rejection under § 102(b) over Hosoda, Applicant respectfully traverses. The present claims are directed to a pressing-sintering method, whereas the cited Hosoda reference is directed to an extrusion molding method. To persons skilled in the art, these are distinct methods. In the pressing-sintering method of the present invention, the powder metal is added to the die in solid, particulate form, and then compacted using a press. A small (less than 1.5%) amount of lubricant powder is typically added to reduce friction during compaction. The particles are then joined to each other during sintering, and shrinkage is minimal. In the extrusion molding method of the reference, a kneaded unit of powder and binder is injected into one end of a die and extruded through the other. Kneading is a term of art in which a screw device is used to mix the powder with binder to form a homogenous paste-like mass. Binder content may be as much as 40% of the paste, but is typically on the order of 18%. Thus, a "kneaded unit" of powder and binder is in a semi-solid paste form, not a solid, particulate form. Flowability of the paste, and therefore high binder content, is essential for extrusion molding methods. During or prior to sintering, the binder is burned out of the composite, which will result in significant shrinkage. Extruding a paste through a die is distinct in the art from pressing (compacting) a powder in a die, as a person having ordinary skill in the art will appreciate. In conventional press-sinter operations, the die completely constrains the powder, and it is pressed therein under pressure or impact from a press punch to

force the particles to consolidate into a compact. In extrusion molding, the part forms by squeezing a paste through opposing ends of a die, and the die does not completely constrain the paste. Examiner does not particularly specify what constitutes a teaching of pressing in the die of Hosoda, and Applicant respectfully asserts that no such teaching is present, as the term is understood in the art. Claims 1-44 have been amended to clarify that the powders are added to the die, and pressed in the die, in solid, particulate form. This is clearly distinguishable from an extrusion method, such as that described in the cited Hosoda reference, where a paste is introduced into the die and extruded therefrom. For this reason at least, claims 1-44 are not anticipated by the cited Hosoda reference, and it is respectfully requested that the rejection be withdrawn.

With specific reference to claims 11, 24 and 39, Applicant again finds no teaching of uniaxially pressing powders in a die by Hosoda. Extrusion out of the die along an axis is not the same as compaction/pressing uniaxially within a die. For this additional reason at least, Applicant respectfully requests that the rejection of claims 11, 24 and 39 be withdrawn.

With specific reference to claims 32-44 and new claims 71-84, Applicant respectfully suggests that the Examiner has not appreciated the sequential order of the steps. While the term "sequentially" was not specifically stated, the language of the claim elements makes clear that the filling, pressing and sintering of the soft ferromagnetic powder occurs first, followed separately by filling and pressing the non-ferromagnetic powder. Referring to the second sintering step on lines 16-18 of claim 32, the compacted non-magnetically conducting segments are sintered with the compacted and sintered magnetically conducting segments

simultaneous introduction and extrusion of the kneaded units to and from the die. Therefore, for this additional reason at least, there can be no anticipation of claims 32-44 and 71-84 by Hosoda, and it is respectfully requested that the rejection of those claims be withdrawn. Notably, the Examiner with respect to claims 4 and 17 recognized the non-anticipation of the subject matter.

Rejections under § 103

With respect to the rejection of claims 4, 6, 10, 12, 17, 19, 23, 25, 27, 28, 31, 38, 40, 42, 43 and 44 over Hosoda, alone or in combination with Achikita et al., Young, Gazza et al., Madsac or Uchida, Applicant respectfully traverses. The present invention is directed to press-sinter techniques in which multiple distinct powders are pressed simultaneously or sequentially in a die to form distinct compacted segments, some that are magnetically conducting and some that are magnetically non-conducting, and then sintered to join the particles within and between segments to form a composite powder metal part. To Applicant's knowledge, the press-sinter technique has only previously been employed for pressing and sintering a single powder in a die. Further, interior permanent magnet rotors are typically produced by stacking stamped laminations and embedding the magnets in the laminations. The ability to bind the particles together not only within each segment, but also between segments provides a strong part with high power density and high speed rotating capability. Hosoda does not teach or suggest the press-sinter technique. Rather Hosoda is only directed to extrusion molding, which is a distinct method, as understood by persons having ordinary skill in the art. Moreover, the press-sinter technique is advantageous compared to extrusion techniques in that the low shrinkage allows for the maintenance of dimensional tolerances and the formation of

strong sinterbonds between the magnetically conducting and magnetically non-conducting segments. The extrusion technique of Hosoda discloses extruding the part from the die, then degreasing and sintering. During degreasing and sintering, the binder is burned out of the part. Because the binder content is significant, as required by the extrusion process itself, the shrinkage will be significant, which will result in weaker bonds between the segments. At the high rotational speeds to which a rotor is subjected, separation of the segments is more likely to occur with the rotor of Hosoda than with the rotor of the present invention. Thus, the method of the present invention is neither taught nor suggested by the Hosoda reference, nor is the same result achieved.

Achikita et al. is directed to injection molding of a single powder, namely Fe-P, and thus does not address the pressing-sintering of multiple distinct powders into a composite with distinct magnetic regions. Thus, Achikita et al. does not address the deficiencies of the Hosoda reference. Young is directed to pressing-sintering of a single powder, and thus does not address the pressing-sintering of multiple distinct powders into a composite with distinct magnetic regions. Thus, Young does not address the deficiencies of the Hosoda reference. Gazza et al. is directed to infiltrating metal into a porous ceramic compact by heating the materials in a vacuum furnace. Beyond using a vacuum furnace, Gazza et al. bears no relation to the press-sinter technique of the instant application or the extrusion molding technique of the primary Hosoda reference. Thus, Applicant asserts that the reference is not properly combinable with Hosoda, and further does not address the deficiencies of the Hosoda reference. Madsac is directed to sintering of a single powder in a belt furnace with a controlled atmosphere, and does not address the pressing-sintering of multiple distinct powders into a

composite with distinct magnetic regions. Thus, Young does not address the deficiencies of the Hosoda reference. Uchida is not directed to powder metal techniques at all, and thus does not address the pressing-sintering of multiple distinct powders into a composite with distinct magnetic regions, and does not address the deficiencies of the Hosoda reference. For these reasons at least, claims 4, 6, 10, 12, 17, 19, 23, 25, 27, 28, 31, 38, 40, 42, 43 and 44 are not obvious over Hosoda, alone or in combination with Achikita et al., Young, Gazza et al., Madsac or Uchida, and it is respectfully requested that the rejections be withdrawn.

With respect to the rejection of claims 4 and 17 over Hosoda, Applicant respectfully traverses. Not only does Hosoda not teach filling, pressing and sintering of one region followed by filling, pressing and sintering of another region, but Applicant fails to appreciate how such a method could be carried out based upon the teachings of the reference. The powder metal is co-extruded out of the die in a paste form (kneaded unit) as a long molded rotor, with the extruded material being longer than the die length. The partition walls are removed as the units are extruded through the die so that a composite molded green part exits the die. The molded green part is then sintered. Applicant fails to appreciate how one might achieve a compacted disk by a sequential ejection method according to Hosoda's teachings. The claims of the instant application recite first filling, pressing and sintering one region, then filling and pressing another region and sintering both regions. Referring to page 14, lines 16-21, this is achieved, for example, by the first powder being filled, pressed and sintered in the die insert, without removing the first segments from the die insert, then filling and pressing the second powder, ejecting the disk, and sintering the entire disk, including the already sintered segments. In Hosoda, if one kneaded unit is extruded, it is no longer in the die. If it is then

sintered, it cannot be placed back in the die, because the die is simply a short through passage for extruding material through to form a long part. Thus, various long extruded components would be formed that would then have to be placed together outside the die, and this would not form a compacted disk. Without the co-extrusion, there is no teaching or suggestion of a means by which the segments would then be assembled together such that a single part is sintered to form a strong, composite rotor. The suggestion that Hosoda can be modified to be a sequential process would seem to be contrary to the teachings of the reference and would render the method unsatisfactory for producing a usable rotor. "If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." MPEP § 2143.01 (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)). Applicant respectfully asserts that the sequential method of claims 4 and 17 is not obvious based upon the teachings of Hosoda, and in fact, is contrary to the teachings of the reference. Thus, for this additional reason at least, Applicant respectfully requests that the rejection of claims 4 and 17 be withdrawn. It is further asserted that the comments regarding claims 4 and 17 are equally applicable to claims 32-44 and new claims 71-84, and thus these claims are likewise allowable over Hosoda.

In view of the foregoing amendments to the claims and remarks given herein, Applicants respectfully believe this case is in condition for allowance and respectfully request allowance of the pending claims. If the Examiner believes any detailed language of the claims requires further discussion, the Examiner is respectfully asked to telephone the undersigned

attorney so that the matter may be promptly resolved. The Examiner's prompt attention to this matter is appreciated.

Applicants are of the opinion that an additional fee of \$84.00 is due as a result of this amendment. Please consider this authorization to charge the amount of \$84.00 to Deposit Account No. 23-3000. If any additional charges or credits are necessary to complete this communication, please apply them to Deposit Account No. 23-3000.

Respectfully submitted,

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